THE UNIVERSITY OF KANSAS
SCIENCE BULLETIN

VOL. XVIII.] APRIL, 1928. [No. 4.

An Exploratory Survey of Characters of Specific Value in the Genus *Gelastocoris* Kirkaldy, and Some New Species.

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THE Gelastocoridæ or Nerthridæ is a family of squat, toad-shaped bugs that are found frequenting the margins of streams and pools, their color patterns blending with their surroundings so completely that the casual observer rarely ever sees them in their native habitat.

The first species of this family, *G. oculatus*, was described by Fabricius[1] under the family Naucoridæ. Later authors have described species under the names Galgulidæ, Mononychidæ and Gelastocoridæ. Galgulidæ and Gelastocoridæ are the better-known names. This family may be distinguished from the two related families, Ochteridæ and Saldidæ, by the antennæ; the antennæ of Gelastocoridæ being hidden, while those of Ochteridæ and Saldidæ are exposed.

The family contains four genera, all of which, as known at present, are found only in the Western Hemisphere. The genus *Gelastocoris* is represented by the largest number of species, the genus *Mononyx* is represented by several species, while the genera *Nerthra* and *Glossoaspis* each are represented by single species. The following key to the genera has been prepared from literature at hand:

KEY TO GENERA.

A. Fore tarsus with two claws.....*Gelastocoris.*
AA. Fore tarsus with one claw.
  B. Wings not fused along median line.
    C. Elytra wholly coriaceous, without clavus or membrane, meeting in a straight sutural line .....*Glossoaspis.*
    CC. Elytra not wholly coriaceous, overlapping .....*Mononyx.*
  BB. Wings fused along median line.....*Nerthra.*

1. Supplementum Entomologiæ Systematicæ, 1798, p. 525.

THE GENUS *Gelastocoris* Kirkaldy, 1897.

According to a catalogue published by Kirkaldy and Bueno[2] in 1908, this genus embraces ten species. In this catalogue the authors raised all subspecies and submerged species to the rank of species, as the status of some species is somewhat doubtful. In this way all the species are kept before the attention of the worker until the identity of each has been established by the examination of types, or abundant material from type localities. Since this list was published two new species have been described, raising the number to twelve.

Inadequate descriptions accompanying named species, and the baffllingly subtle and elusive characters of the bugs of this genus, have brought about the well-nigh hopeless condition of this group. Mr. J. R. de la Torre Bueno[3], who has been a student of aquatic Hemiptera for many years, has written that "the genus is represented by an uncertain number of undescribed species."

Under the direction of Dr. H. B. Hungerford, who has assembled what is probably the largest collection of *Gelastocoris* known, the author has been able to make a study of considerable material, and from these studies has gained a clear species concept of this difficult genus. It has been possible to find some characters that will aid in more accurately determining a species than has been possible in the past. With this information it is felt that now when a study is made of the old types it will be of more value than it would have been under the present conditions of the taxonomy of *Gelastocoris*.

The author wishes to take the opportunity here to express his most sincere appreciation and thanks to Dr. H. B. Hungerford for his most helpful suggestions and kindly interest in the problem. Thanks are due, also, to Mr. W. S. Blatchley, who has been so kind as to loan paratype specimens of his species, *G. subsimilis;* and to Dr. W. E. Britton for the loan of *G. barberi* Bueno.

The characters that have received special attention in these studies are: The front, the antennæ, the eyes, the metaxyphus, pro-, meso- and metasternum, metasternal orifice, the ovipositors of the females, the granulations on the body surface, the ventral abdominal segments of the males, the thoracic margins, the shape and size of the body, color, and the male genital capsules. These characters fall into three groups: characters of no value, characters of value but difficult to use, and characters of value.

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2. Kirkaldy, G. W., and Bueno, J. R. de la Torre. A catalogue of American Aquatic and Semiaquatic Hemiptera: Proc. Ent. Soc. Wash., Vol. X, Nos. 3, 4, Sept.-Dec., 1908.

3. Connecticut Geological and Natural History Survey, Bull. 34, 1923, Hemiptera of Connecticut; Family Uerthridæ, pp. 392-396.

CHARACTERS OF NO VALUE.

The shape and slope of the front varies in specimens of the same species. The ridges of the front differ to a certain extent for some species, while for others there seems to be no variation. It has been possible to separate two species from Ecuador by this character; the one species has a transverse ridge across the base of the front, while specimens of the other species are marked by a conelike protuberance. As the genus is so plastic, a long series would probably disprove this character. Such distinct differences do not hold for other species.

Blatchley[4] states that these insects have three or four segmented antennæ, and other authors say that there are four segments in the antennæ. In three species that have been examined, *G. oculatus* (Fabr.), *G. rotundatus* Champ., and *G. quadrimaculatus* (Guer.), five segments are found. A small segment that is not easily seen with ordinary powers of the binocular is between the second and fourth segments and is not always visible with the high powers unless it is put on a wet slide. In some specimens of *G. quadrimaculatus* the second and fourth segments were in such close contact that the third segment could not be found. In the short series studied, the segments varied for different species, especially the fourth. The antennæ have not been considered a character of major importance, so a large series has not been studied.

Some differences exist between the eyes of different species, but as with the front, the differences are not easily measured and have not been considered of much value. In some the eyes are inclined more anteriorly than what might be called normal, while with others the eyes are inclined more posteriorly than normal.

The metaxyphus does differ among species, but the wide variation within a species is so great that this character is not of any appreciable value. The spines on the metaxyphus vary in number along the margin and may or may not be present in the same species. Since the male insects are asymmetrical, this character is not always of the same shape for both sides.

The prothoracic, mesothoracic and metathoracic sternites were studied, and conclusions were reached that they are not good, stable characters by which accurate determinations can be made. The shape varies greatly within a species, and does not differ greatly enough among species to make it a good character. In *G. oculatus*

4. Heteroptera or True Bugs of Eastern North America, 1926, pp. 1022-1029.

(Fabr.) the spines on the metasternite varied greatly in number and size. The spines upon specimens from Arizona were sparsely scattered and small, while upon specimens from Kansas they almost covered parts of the metasternite and were larger in size.

The general shape of the metasternal orifice varies in shape within a species. Its position also may be different on different specimens of the same species. The shape of the lips of the orifice is of no value, as drying of the insect would cause their distortion.

An extensive study of the ovipositors of the females has not been made. In some species the spines are very stout, while in others they are smaller and not nearly so stout. An attempt was made to separate species on the arrangement of the spines of the ovipositor, but the pattern varied greatly, and soon the number of groups of spine patterns exceeded the actual number of species.

CHARACTERS OF VALUE BUT DIFFICULT TO USE.

The size and distribution of the granulations on the dorsal region of the body varies some for different species, but they are not of any great value as a character to aid in the determination of a species, because it would be very difficult to describe them. The granulations found on *G. rotundus* (Champ.) are very evenly distributed, giving them an appearance of being smaller than they actually are. With most species they are uneven in size and distribution.

The shape of the ventral abdominal segments offers an external character for separating males that might be used as an auxiliary character. This character was fairly constant in the series examined. The telescoping of the abdomen will vary for a species, and is not a very good specific character. The last caudal segments vary in shape and length for different species. The main difficulty that presents itself in the use of this character is that the segments may shift their positions so that the general aspect of the segments is changed, and thus at times becomes misleading. The position of the spiracles on the last segments is of no value. In some species they are found with difficulty. For some species the posterior spiracle shifts its position because the segment it is upon shifts its position. The spiracle opposite this one has not been found.

CHARACTERS OF VALUE.

The margins of the prothorax differ strikingly enough among species that it is considered as a good character. The margins show a great range of variation within a species, but once a characteristic

shape is learned with its variations, a species may be usually determined quite easily. The slope of the disc of the thorax is not considered as a character of any importance.

The color of these insects is helpful in determining most species; however, it cannot be relied upon as an accurate check. Possibly *G. oculatus* (Fabr.) shows as great a range of color as any of the species described. We give notes on color under the discussion of the species.

The size and shape of the body are gross indicators of a species. Some species show a great range in size and shape, while with others these characters were fairly constant in the series examined. The length of *G. quadrimaculatus* (Guer.) ranged from 5.29 mm. to 6.46 mm. for a series of males. This species is very unstable morphologically. The measurements given in the descriptions at the end of this paper for the length of the body are taken from the anterior margin of the pronotum to the tip of the wings. The slope of the front depends in part upon the position of the head, so it does not offer a stable point from which to measure.

Hungerford[5] suggested that the genitalia of the male might be of value in helping to distinguish one species from another. As was predicted, studies of the genitalia of the male were very fruitful. To aid in these studies long, narrow trays of plaster of Paris were made with partitions in which to keep the individual genitalia separate, yet conveniently placed for comparative study. With these trays it was possible to have a long series ready for immediate comparison without any danger of mixing the specimens. It was found that structures could be studied more carefully if the capsule were left to dry. However, when it was desired to make studies under water, the tray would be filled with water and placed in a small dish in which water was poured until the tray was not quite submerged. In this way water could be added from time to time without disturbing the contents of the tray.

The genitalia were dissected by holding the relaxed insect between the thumb and forefinger while a curved dissecting needle was inserted along the side of the capsule and then carefully worked around the anterior edge of the bulb, breaking the membrane loose from the body wall. After this had been done the chitinized capsule could be pulled out quite easily and either kept in a small vial of

5. Kan. Univ. Sci. Bul., Dec., 1919, Ent. No. The Male Genitalia as Characters of Specific Value in Certain Cryptocera (Hemiptera-Heteroptera), pp. 329-331; Pl. XXI, Figs. 5 and 7, pp. 334, 335.

alcohol, numbered with the specimen, or mounted on a point, the point being kept with the specimen.

The caudal segments of the male have made a quarter turn to the right so that the tips of the claspers point to the right instead of dorsally. In most insects both claspers are equally developed, but in this group the left clasper is much reduced, and has a ventral position in respect to the insect. It is more or less strap-shaped, the shape varying some in a few species.

To aid in the description of the genital parts the nomenclature employed by Hungerford[6] has been used, namely: left clasper, right clasper, and distal angle of the right clasper. The following have been arbitrarily added: right clasper hook, tip of right clasper hook, bulb, keel, keel hood, pan, and secondary pan. (See Pl. LIX, Fig. 18.)

The left clasper has already been discussed. For the sake of comparison the right clasper can be likened to a capital letter "J" made backwards, in both shape and position. Along its anterior lateral margin rows and patches of peglike structures are found. The number of these structures or their distribution pattern seems to be of no special value as a specific character. The caudal margin of the right clasper is produced into a flat plate which bears a curved, fingerlike process that has been termed the right clasper hook. (Pl. LIX, Figs. 18 and 19.) The wide range of variations of the right clasper hook make it useless as a specific character.

The angle formed by the right clasper hook and the lateral margin of the clasper has been termed the distal angle. This angle has no value as a character for determining a species. (See Pl. LIX, Fig. 20.) The plate at the end of this paper shows the wide range of variation of this angle in *G. oculatus* (Fabr.).

The tip of the right clasper is not a very good character, since it is not always of the same length and shape within a species. Though the shape of the bulb does differ among species, it is believed that it is of little use taxonomically. The posterior arm of the bulb, which has been termed the keel, bears characters that can be depended upon as an aid in accurately determining a species. The hook on the distal end of the keel (the keel hook) has a characteristic shape for each species that possesses it. In some species there is quite a range of variation in the size of this hook. In the species *G. quadrimaculatus* (Guer.) the size and shape might be quite mis-

6. See footnote 5.

leading unless one is familiar with the species. Some species are without a keel hook. The reader is referred to the plates at the end of this paper for the shapes of different species.

The shape of the keel hook aids in the determination of a species. It is normally placed on the ventral side of the keel, with respect to the insect, but in some species it may be displaced laterally. A secondary keel hood appears in *G. cucullatus* n. sp.

The shape of the pan is an indication of a species. (See Pl. LIX, Fig. 18.) Upon the pan is a small structure that we have termed the secondary pan. It is not of much value as a character.

CONCLUSION.

From the above studies one can draw the following points, which are the only ones of significance in determining a species: The genitalia of the male supply certain stable characters, as do also the lateral margins of the prothroax of both male and female, and the ventro-caudal segments of the abdomen of the male, with due regard for the range of variation of each specific character. The combination of the structural features mentioned above may be relied upon to differentiate the species in this exceedingly difficult genus.

Gelastocoris oculatus (Fabr.).

Naucoris oculata Fabricius; 1798. Ent. Syst., Suppl., p. 525.
Galgulus oculatus (Fabr.) Latreille; 1802. Hist. Nat. Crust. Ins., III, p. 254.
Gelastocoris oculatus (Fabr.) Kirkaldy; 1897. Entomologist, XXX, p. 258 (n. n. for *Galgulus* Latr.).
Gelastocoris barberi Bueno; 1923. Conn. Nat. Hist. Survey Bul. 34, p. 393, Fig. 38.
Gelastocoris subsimilis Blatchley; 1926. Heteroptera of Eastern North America. The Nature Publishing Co., Indianapolis, Ind., p. 1025.

Fabricius' original description, translated, is as follows:

"Margin of abdomen supplied above with black, anterior feet two-clawed.
"Habitat: in Carolina.
"Closely related to *N. nepaeformi* but distinctly different. Head small with boldly prominent eyes, ring of eyes ovate, subspinose. Thorax flat. black. Elytra black, immaculate. Anterior feet scarcely incrassate, tibia elongate, tip of foot, incurved, claws incurved, sharp, stout."

Thoracic margins, plate LVIII, Figs. 9, 10, 11, 12, 13. Genitalia of male, plate LIX, Figs. 1, 2 and 3. Length: Male, 4.4 mm. to 7 mm.; female, 6.3 mm. to 8.1 m.

This is the only species of this genus found in the United States with the exception of *G. rotundatus* Champ., found in Arizona; *G. vicinus* Champ., which Champion says inhabits the Southern and Western states; and according to Van Duzee, *G. variegatus* (G.) in the Western states. We have at hand 550 specimens of this insect collected in the Atlantic Coast, Southern, Central, Southwestern, and Pacific Coast states. It is a species that shows a great

range of variation in morphological characters and in color variation. Our plate LVIII, figures 9, 10, 11, 12 and 13, show some of the variations of the thorax. It will be noted that there are no two alike, but all have the same general appearance. Other variations of the surface and shape of the sternites and other body structures have been mentioned elsewhere in this paper.

The genitalia of the male show many individual variations. Plate LIX, figure 20, shows a series of distal angles (the distal angle is found on the right clasper). It will be noted that there is a gradual gradation from the oblique angle to the acute angle, proving beyond doubt that the angle is only an individual variation and not a specific difference. The keel hood, the keel hook, the pan, and the secondary pan show a great deal of variation. However, when everything is taken into consideration, all the genitalia are of the same general type as shown on plate LIX, figures 1, 2 and 3.

G. oculatus (Fabr.) shows the greatest variation of color of any of the described species that we have at hand. When groups of individuals are considered, several color varieties might be described. But when the whole group of specimens at hand are taken into consideration, it is seen that there is a gradation from one color to another. The genitalia of the males are all of the same type, so they are not different species; possibly good ecological species, but they are not good taxonomic species. Specimens from Florida and North Carolina have a ground color of brown or dark brown, almost black in some specimens, variegated with light-colored granules. Other specimens from North Carolina, Tennessee, Louisiana, Arkansas, Texas, Kansas, Missouri, Nebraska, Arizona and Oregon range from a black to a light grey, and from a dark brown to a light tan for the ground color. The granules are, for the most part, some shade of white. The arrangement of the large and small granules makes a variegated pattern on the ground color. Some are strikingly variegated, while others are more obscurely variegated. Some particular specimens from central Kansas and Texas have the medial area of the dorsal region of a dark reddish-brown color, while the lateral margins are splashed with yellow. In some specimens a tinge of lilac appears where the yellow and brown blends. With some specimens from western Kansas the dorsal surface is from a gray to a bright black, spotted with a yellowish-white, the white color being tinged with pink. The pronotum is mottled with shades of brown and spotted with yellowish-white tinged with pink. The specimens are indeed colorful and vie with Guerin's *G. variegatus* in beauty. Other specimens from this region and from Oregon are of a velvety brown

with white granules. As mentioned before with other specimens the arrangement of the granules gives a variegated effect. These are also very handsome specimens, and have been determined erroneously as *G. variegatus* (Guer.). A male from Arizona and a female from Oregon are marked with various shades of tan and red. The base of the pronotum is a light-green color. Other specimens show other color schemes.

Van Duzee[7] gives the following locality records: New York, New Jersey, Pennsylvania, Maryland, District of Columbia, "Carolina," Georgia, Florida, North Carolina, Ohio, Illinois, Minnesota, Colorado, Oklahoma, Arizona. To which list we add the following records: Tennessee, Louisiana, Missouri, Arkansas, Kansas, Nebraska, Texas, California and Oregon. This is the first time, to the best of our knowledge, that this species has been reported from the Pacific coast. The following records are from Kansas: Douglas county, H. B. Hungerford, collector; Bourbon county, R. H. Beamer, collector; Woodson county, R. H. Beamer, collector; Neosho county, Mrs. Grace Wiley, collector; Labette county, R. H. Beamer, collector; Cherokee county, H. B. Hungerford and R. H. Beamer, collectors; Riley county, J. B. Norton, collector; Saline county, C. H. Martin, collector; Ellsworth county, C. H. Martin, collector; Rice county, C. H. Martin, and others, collectors; Reno and Barton counties, Cavanaugh, collector; Pawnee, Meade and Comanche counties, C. O. Bare, collector; Morton county, C. O. Bare and others, collectors; Wallace, Logan, Norton, Graham and Rooks counties, F. X. Williams, collector. From these records we see that this insect inhabits all parts of Kansas.

SPECIES IN SYNONYMY.

Gelastocoris barberi Bueno. Through the kindly interest of Dr. H. B. Hungerford and the generosity of Dr. W. E. Britton I have been permitted to examine the type specimen of this species. The collections of the University of Kansas contain a series of specimens from Kansas and Texas that are similar. These specimens are all *G. oculatus* (Fabr.). *Gelastocoris barberi* Bueno is a synonym of *G. oculatus* (Fabr.).

Gelastocoris subsimilis Blatchley. We had two specimens of this insect, one collected at LaBell, Fla., by D. M. DeLong, and one collected at Hertford, N. C., by W. R. Walton, which we identified as *G. subsimilis* Blatch. Later we were able to verify the identification with a male and a female paratype loaned by Mr. Blatchley. Fortunately, at the time Mr. Blatchley's paratypes were in our hands, Mr. C. O. Bare sent in a series of 17 males and 20 females collected

7. Van Duzee, E. P. Cat. of the Hemiptera of America North of Mexico. . . . Univ of Calif. Pub. Tech. Bul., College of Agri., Agricultural Experiment Sta., Ent. Vol. I, 1917, p. 472.

in Florida which were identical with Blatchley's paratypes. A comparison of the thoracic margins (Pl. LVIII, Figs. 9 and 11) with those of *G. oculatus* (Fabr.) (Pl. LVIII, Figs. 10, 12 and 13), show that the thoracic margins of *G. subsimilis* are of the type of those of *G. oculatus*. When the color patterns were studied it was found that they were also the same as for *G. oculatus* from other localities. While the males are smaller than the males from other localities, yet their genitalia (Pl. LIX, Fig. 1), are the same size and the same type as those of males from other localities. (Pl. LIX, Fig. 2, 3.) Taking the thoracic margins and color patterns in consideration and using the genitalia of the male as final proof of our assertion, *Gelastocoris subsimilis* Blatchley is a synonym of *Gelastocoris oculatus* (Fabr.).

Gelastocoris bufo (H-S.).

Galgulus bufo Herrick-Shäffer, 1839 or 1840 (?). Die Wansenartigen Insekten; V, p. 88, Pl. 174, Fig. 536.

His original description is as follows:

"G. fuscescens, subtus pallidior, tibis et tarsis posterioribus pallidis fusco annulatis.

"Da ich dieseinzige Art dieser Gattung vor mir habe, so kann ich nicht mit Bestimmtheit behaupten, ob es wirklich Lefebvre's bufo ist. *G. oculatus* (F.) kann es nicht wohl sein weil hier der Bauch schwarz sein soll.

"Gestalt kurz eiförmig, unten flach, oben wenig convex; die Oberfläche durch äusserst feine Korchen chagrinartig, matt rötlich graubraun, gegen die Spite der Decken mehr rotbraun. Kopf, Thorax, und Schildehen durch ziemlich unregelmässige Erhöhungen uneben; die Wurzelhlfte der Decken braun und grau sehr zierlich gewässert, die schmale Membran schmutzig weiss. Unten blassbraun, mit lichen Rändern aller Theile. Auch die Flúgel sind bis úber die Zellun hinaus braun, und nur an der Spitze weiss.

"Aus Amerika; ohne genauere Angabe von Herr Norwich in Bremen."

Thoracic margins, plate LVIII, figure 14. Length: Male, 6.98 mm.; female 7.43 mm. to 7.65 mm.

We have at hand one male identified by Champion, who collected it at Guatemala City. The genitalia of the male have been removed by someone in the past, so we are not able to figure them. The thoracic margins are very characteristic. The specimens are of a mottled reddish-brown color.

Champion gives the localities Mexico, Guatemala and Costa Rica as its habitat. Our specimens are from these localities.

Gelastocoris flavus (Guerin).

Galgulus flavus Guerin, 1844, Iconographie du Regne Animal de B. Cuvier per Felix Edouard Guerin-Meneville. Tome (II, III or IV [?]), pp. 251-255.

Guerin's original description translated is as follows:

Entirely of a dirty yellowish-russet, shading to brown; underneath more pale, some small, smooth tubercles, green and yellow, on elytra. Posterior legs faintly ringed with brown. Length, 7 mm.; width, 5 mm.

"Figures 4*a*, its large head and view of face; 4*b*, antennæ.

"Habitat: The interior of Brazil.

"Notes: This species is very closely related with *Galgulus bufo* of Hahn."

We possess three males and three females of this species. Some of the males are above and below of a lurid red, concolorous; others dark yellow and black in color. The wings of the females are shorter than the abdomen. One female is of a dull red while the other two are of a reddish-brown. Both males

and females possess six short, longitudinal carina on the base of the pronotum that may be faint or prominent. Some specimens have the lateral edges of the pronotum broadly crenate. The specimens at hand do not possess the green tubercles that Guerin mentions, but such colored tubercles have no particular significance, and may or may not be present.

Guerin's figure shows that the insect that he had had the base of the pronotum straight. In our specimens it is arcuate. Champion mentions that with his species the base of the pronotum is trisinuate. Our studies of the bases of other species show that they are very variable, and it is very probable that this species shows an even greater variation than in the species we have seen.

Thoracic margins, plate LVIII, figure 18. Male genitalia, plate LIX, figures 4, 5 and 6.

Champion gives as the habitat, Costa Rica, South America, to Peru and Bolivia. Our specimens are from Brazil, Bolivia and Paraguay. We believe that possibly the females that we have at hand are the only ones of this species that have been seen.

Gelastocoris quadrimaculatus (Guerin).

Galgulus quadrimaculatus Guerin; 1844. Icon. Ins., p. 351.
Galgulus nebulosus Guerin; 1844. Icon. Ins., p. 351.
Galgulus nebulosus var. *b* Stal; 1876. Svenk. Vet.-Ak. Handl. Enumeratio Hemipterorum, 14, No. 4, p. 137.
Gelastocoris stali Kirkaldy and Bueno; 1908. A Catalogue of American Aquatic and Semi-aquatic Hemiptera. Proc. Ent. Soc. Wash., Vol. X, Nos. 3 and 4, Sept. to Dec., 1908.

His original description translated is as follows:

"Upper part black or very dark brown, with the head and sides of the prothorax, some little spots on the scutellum, and one spot on each side at the back, on the posterior edge of the elytra, of yellowish russet. Some small green and very smooth tubercles on the elytra. Underneath and the legs yellow, with the base of the abdomen black, and the sides alternately black and brown. Posterior legs ringed with brown. Length, 7 mm; Width, 5 mm. "From Brazil and Bolivia."

Thoracic margins, plate LVIII, figures 1, 2, 3, 4, and 5. Male genitalia, plate LIX, figures 14, 15 and 16. Length: male, 5.29 mm. to 6.45 mm.; female, 5.18 mm. to 6.88 mm. It will be noted that our measurements fall shy of Guerin's. However, it must be remembered that our measurements do not include the head of the insect.

We have in the collections 62 females and 52 males from Bolivia, Paraguay, Brazil and Ecuador. The species show a great variation in size and otherwise morphologically. Even the male genitalia show extreme differences in size, and also differences of structure. However, all are of the same general type, and all the specimens at hand are considered to be the same species. Some species are of a buff or tan color with or without green tubercles; others are fuscus with or without green tubercles. One specimen is mottled with a lurid red on a buff-colored background. Other specimens have the median part of the dorsal region black, while on each side of the black stripe it is buff or tan.

SPECIES IN SYNONYMY.

Stal reduced *G. quadrimaculatus* to a variety under *G. nebulosus,* and then described his variety *b* under *G. nebulosus* (G.). Following the Zoölogical

Code, *G. quadrimaculatus* takes precedence over *G. nebulosus*, as it was described before *G. nebulosus* in the paper. Because of the wide variation exhibited by this species and from the study of the genitalia and color of our specimens, we believe that Guerin described the same insect under two names, his G. *nebulosus* being different only in coloration, which is not a good character for most species in this genus. Both species come from the same countries. Stal's *G. nebulosus* var. *b* is very evidently just another color variation of the species. As Kirkaldy and Beuno raised Stal's variety to a species it will fall.

Gelastocoris variegatus (Guerin).

Galgulus variegatus Guerin; 1844. Icon. Ins. p. 352.

Guerin's description translated is as follows:

"Above a variation of dark brown, of black, of gray more or less whitish, and of yellow. The gray forms some round spots surrounded with deep black; some very small, smooth, ivory white tubercles on the elytra. Underneath black with the sides of the thorax spotted with white and that of the ventral with russet. All the legs banded with dark brown and russet. Length, 6 mm. to 7 mm.; width, 4½ mm. to 5 mm. From the Bay of Campeche. Taken by M. Perbose, surgeon of the Royal Marine at Toulon."

Thoracic margins, plate LVIII, figure 8. Male genitalia, plate LIX, figure 10.

The thoracic margins of this insect are very distinct. In Champion's words, "the pronotum is subparallel at the sides in front. The lateral angles are foliaceous, very distinctly crenate in front and behind, and transverse or subtransverse along their anterior edge." As with other species, there is a variation in the color of different specimens. Champion gives as its habitat North America, southern and southwestern United States; Costa Rica; Argentina; Antilles; Cuba; and Panama. Our specimens are from Guatemala and Mexico.

Gelastocoris pulcher (Stal).

Galgulus pulcher Stal.; 1854. Ofversigt af Kongliga Vet.-Ak. Förhundlingar. Stockholm, XI, p. 239.

Stal's original description translated is as follows:

"1. *G. pulcher:* Very densely coarsely granulate, brown and white wavy variegated, thorax convex, flat, subimpressed transversely, last part and base angularly dilated; scutellum trituberculate; exterior margin of clavus becoming reddish; blackish underneath, variegated with white; legs whitish, ringed with brown. Length, 7 mm.; width, 5 mm. Habitat: Mexico."

Champion placed this species in synonymy under *G. oculatus* (Fabr.). The description suggests Herrick-Shäffer's colored figure of his *G. bufo*.

Gelastocoris vicinus Champion.

Gelastocoris vicinus Champion; 1901. Biologia Centrali-Americana, Insecta Rhynchota. Hemiptera-Heteroptera, Vol. II, by G. C. Champion, F. Z. S.; 1897-1901, p. 349.

Champion's original published notes are as follows:

"Montandon has sent us for examination numerous specimens of this insect from Costa Rica, and also one from Mexico, and we have many others from Nicaragua and Chiriqui agreeing with them. It is very much like *G. variegatus*, but has the foliaceous lateral angles of the pronotum more oblique in front (instead of transverse) and less coarsely crenate. The pronotum is strongly constricted at the sides behind the anterior angles, the margins being sub-

parallel in front. The general coloration is usually more obscure than in *variegatus*. *G. vicinus* is the only species of the genus found by myself at elevations above 2,500 feet on the slope of the Volcan de Chiriqui.

"Habitat: North America, southern and western United States; Mexico; Panama; South America to Brazil."

Thoracic margins, plate LVIII, figure 7. Male genitalia, plate LIX, figure 9. Length, 6.3 mm.

We possess two specimens collected at R. Surnbres, San Mateo, C. R., altitude 250 m., February, 1905.

Gelastocoris rotundatus Champion.

Gelastocoris rotundatus Champion; 1901. Biologia Centrali-Americana, Insecta Rhynchota. Hemiptera-Heteroptera, Vol. II. By G. C. Champion, F. Z. S., 1897-1901, p. 347; Pl. 20, Fig. 18.

Champion's original published notes are as follows:

"Of this species we possess about a dozen examples, agreeing with the types communicated by M. Montandon. It is nearly allied to *G. oculatus* (Fabr.), but differs from that insect in having the pronotum broadly rounded at the sides and feebly sinuate behind the anterior obtuse angles. In one of the specimens from Pinos Altos the entire upper surface is mottled with reddish brown. *G. rotundatus* will almost certainly inhabit the southern part of the United States. A spotted example from Guatemala City is figured.

"Habitat: Mexico; Guatemala."

Probably Champion never intended that this species and *G. vicinus* Champion should be credited to him. As no other descriptions of these species can be found that were published before Champion's, his description's are taken to be the original descriptions.

Thoracic margins, plate LVIII, figure 16. Male genitalia, plate LIX, figure 8. Length: Male, 6.95 mm. to 7.0 mm.; female, 7.2 mm. to 7.3 mm.

We have at hand 14 specimens, most of which are mottled with reddish brown; one is black mottled with tan. Two of our specimens were collected at Douglas, Ariz., August, by F. H. Snow, which is the first time that a record for this species from the United States has been published.

Gelastocoris cucullatus n. sp.

Length: Male, 4.96 to 5.40 mm.; female, 5.85 mm.

A species near *G. variegatus* (Guer.) and *G. vicinus* Champion. Does not possess the transverse lateral margins of the thorax of *G. variegatus*, and is of an ovate shape instead of the elongate shape of *G. vicinus*.

COLOR. Ground color of males black to different shades of brown. Some specimens strikingly marked with patterns of yellowish-white, others more obscurely marked. Three specimens at hand have the color and markings of *G. variegatus*. Some females are black, streaked with brown, others are brown, marked with darker brown.

MARGINS OF THORAX. Plate LVIII, figure 6. Posterior angle more broadly rounded than that of *G. vicinus*.

GENITALIA OF MALE. Plate LIX, figures 11, 12 and 13. The angle found on the margin of the keel hood and the secondary hood beneath the keel hood, which may or may not reach the dorsal edge of the keel hook, are characteristic structures of the genitalia of the male.

Described from 4 males collected at Los Amates, Guatemala, by Kellerman; 1 male collected at Guatemala City, by Champion (det. by him as *G. oculatus*); 1 male, no locality record, marked O. Sacken; a male and a female collected at Canal Zone, Barro, Colorado, by N. Banks; 1 female collected at Penemoma, Panama, by H. Brown; 1 male collected at Gualan, Guatemala, April 1, 1905. Holotype, male (Guat.), allotype (Pan.) female and 3 paratypes deposited in the entomological collections of the University of Kansas; 1 paratype deposited in the Carnegie Museum; 1 paratype deposited in the American Natural History Museum.

Gelastocoris fuscus n. sp.

Length: Males, 6.3 mm. to 7.2 mm.; females, 6.75 mm. to 7.43 mm.

Resemble *G. bufo* (H-S.) but with the lateral margins of the pronotum more deeply constricted.

COLOR. Color generally fuscous, some black present. With some specimens the pronotum is of a lighter color than the rest of dorsal region.

MARGINS OF THORAX. Plate LVIII, figure 15. Lateral margins of thorax more or less crenate. Posterior angle may be sharp or rounded. Considerable variation is found among individual specimens.

GENITALIA OF MALE. Plate LIX, figure 17. Instead of a keel hook a flaplike structure is present.

Described from 5 specimens collected at Tena, Ecuador, February 23 and 28, 1923, by F. X. Williams; 1 male collected at S. Paulo Olivonca, Brazil, by S. Klages; 1 female collected at Banos, Ecuador, June 22, 1923, by F. X. Williams; 1 female collected near Napo, Ecuador, February 14, 1923, by F. X. Williams. Holotype, male (Ecuador), allotype, female (Ecuador) and 5 paratypes deposited in the entomological collections of the University of Kansas; 1 male paratype (Brazil), deposited in the Carnegie Museum, Philadelphia.

Gelastocoris duplicatus n. sp.

Length: Male, 5.85 mm.; female, 6.75 mm.

It is difficult to distinguish this species form *G. fuscus* n. sp. The shape of the body for the specimens that we have is somewhat different from that of *G. fuscus*. Also the posterior margin of the posterior angle of the margins of the pronotum is more nearly subparallel than those of *G. fuscus*. The genitalia of the male is very strikingly different from that of *G. fuscus*.

COLOR. Dorsal region from black to dark brown, nearly concolorous; ventrally fuscus. Base of pronotum greenish yellow to orange; disk, ground-color black, with greenish granulations, prominent orange spots on the disk of the specimen at hand. Females with more black in ground color than male, granulations tan color, pronotum tan and black.

MARGINS OF THORAX. Plate LVIII, figure 17. Margins of thorax most nearly resembles those of *G. vicinus* Champion and *G. quadrimaculatus* (Guer.)

GENITALIA OF MALE. Plate LIX, figure 7. Genitalia with a very robust, double keel hook and a double pan.

Described from a male and a female collected at Naranjapta, Ecuador, 1,850 feet, December 14, 1923, by F. X. Williams. Holotype male, allotype female, deposited in the Entomological Collections of the University of Kansas.

EXPLANATION OF PLATES.

PLATE LVIII.

Thoracic margins of *Gelastocoris*.

FIGS. 1, 2, 3, 4, 5. *Gelastocoris quadrimaculatus* (Guer.).
FIG. 6. *Gelastocoris cucullatus* n. sp.
FIG. 7. *Gelastocoris vicinus* Champion.
FIG. 8. *Gelastocoris variegatus* (Guer.).
FIGS. 9, 10, 11, 12, 13. *Gelastocoris oculatus* (Fabr.).
FIG. 9. Specimen from Florida. A specimen of *G. subsimilis* Blatchley, in synonymy.
FIG. 10. Specimen from Arizona.
FIG. 11. Specimen from Florida. Drawn from a paratype specimen of *G. subsimilis* Blatch., species in synonymy.
FIG. 12. Specimen from western Kansas.
FIG. 13. Specimen from North Carolina.
FIG. 14. *Gelastocoris bufo* (H-S).
FIG. 15. *Gelastocoris fuscus* n. sp.
FIG. 16. *Gelastocoris rotundatus* Champion.
FIG. 17. *Gelastocoris duplicatus* n. sp.
FIG. 18. *Gelastocoris flavus* (Guer.).

PLATE LVIII.

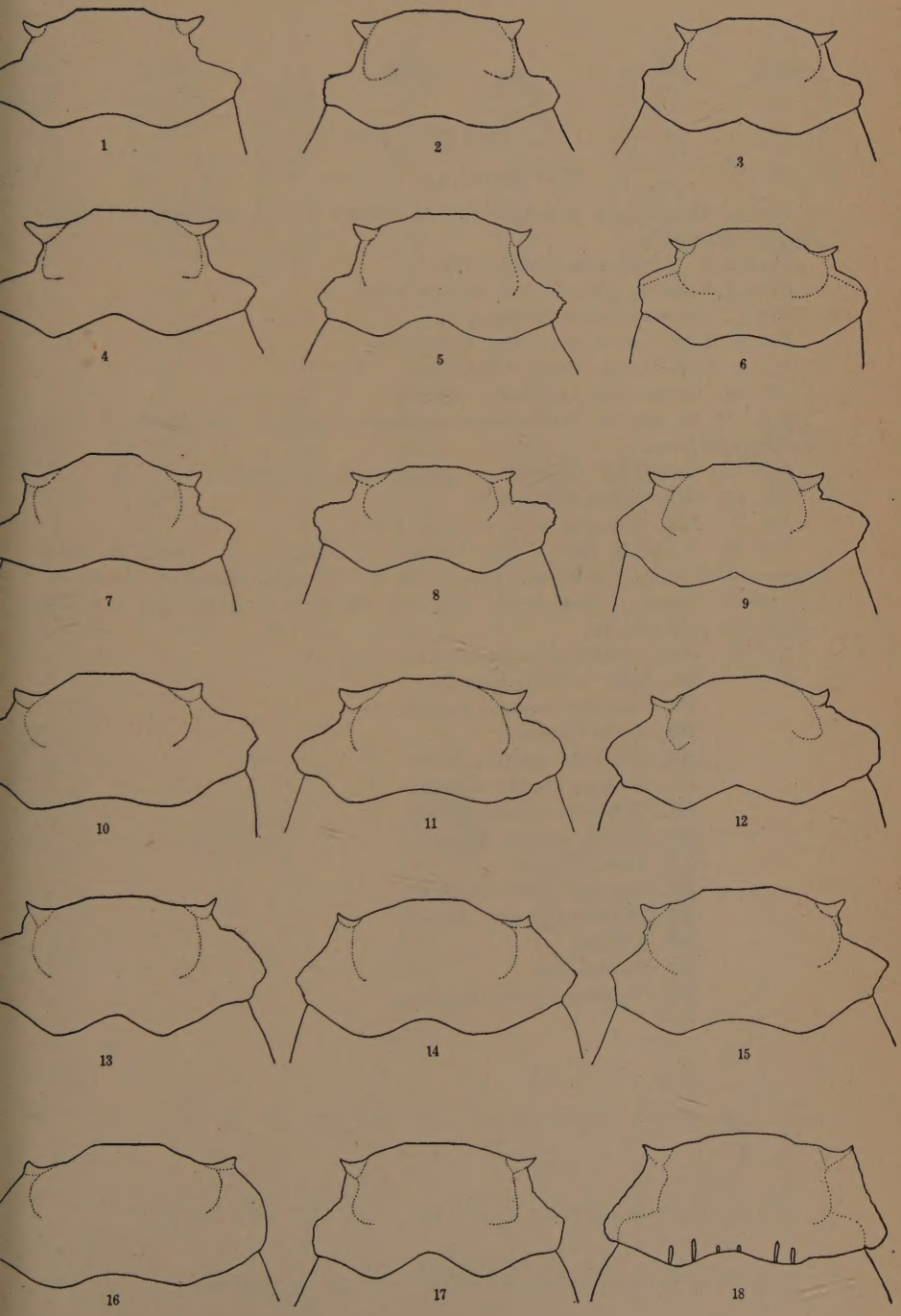


PLATE LIX.

Male genitalia of *Gelastocoris*.

FIG. 1. *Gelastocoris oculatus* (Fabr.). Drawn from a specimen of Blatchley's *G. subsimilis*.

FIGS. 2, 3. *Gelastocoris oculatus* (Fabr.).

FIGS. 4, 5 and 6. *Gelastocoris flavus* (Guerin).

FIG. 7. *Gelastocoris duplicatus* n. sp.

FIG. 8. *Gelastocoris rotundatus* Champion.

FIG. 9. *Gelastocoris vicinus* Champion.

FIG. 10. *Gelastocoris variegatus* (Guer.).

FIGS. 11, 12, and 13. *Gelastocoris cucullatus* n. sp. A, keel hood. B, Secondary keel-hood.

FIGS. 14, 15 and 16. *Gelastocoris quadrimaculatus* (Guer.).

FIG. 17. *Gelastocoris fuscus* n. sp.

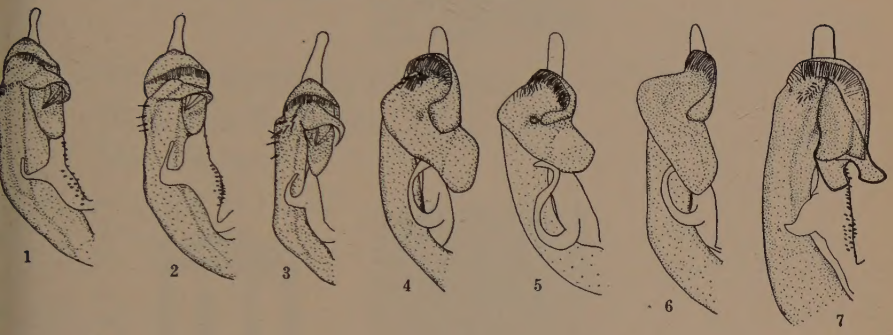
FIG. 18. Male genitalia of *G. oculatus* (Fabr.).

FIG. 19. A and B, right clasper hooks of *G. fuscus* n. sp. C and D, right clasper hooks of *G. oculatus* (Fabr.). E and F, right clasper hooks of *G. rotundatus* Champ. These figures illustrate the wide variation that is found within the same species.

FIG. 20. Distal angles of *G. oculatus* (Fabr.).

20*a*, Riley county, Kansas.
20*b*, Cherokee county, Kansas.
20*c*, North Carolina.
20*d*, Colorado county, Texas.
20*e*, Douglas county, Kansas.
20*f*, Ellsworth county, Kansas.
20*g*, Morton county, Kansas.
20*h*, Austin, Texas.
20*i*, Bourbon county, Kansas.
20*j*, Comanche county, Kansas.
20*k*, Arizona.
20*l*, Tucson, Ariz.
20*m*, Pawnee county, Kansas.

PLATE LIX.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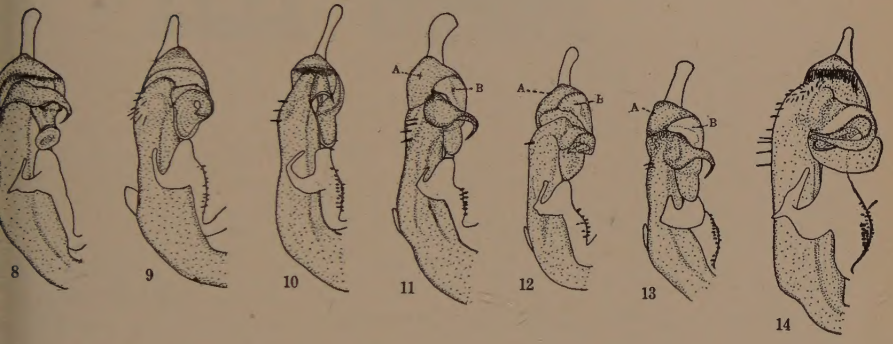
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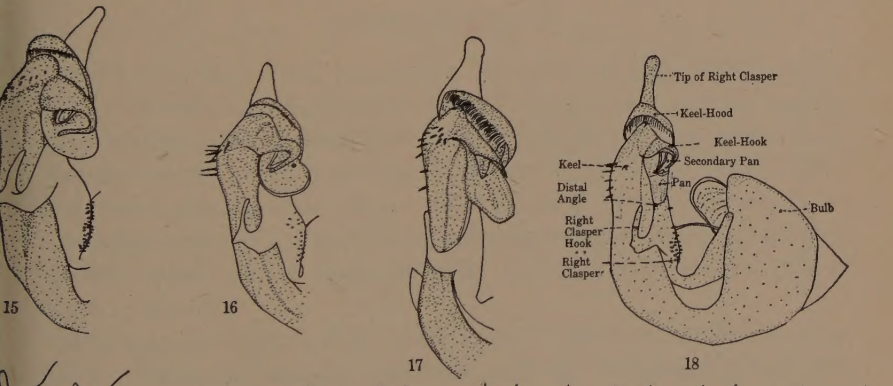
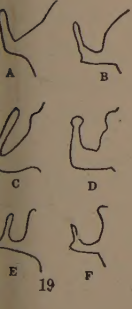
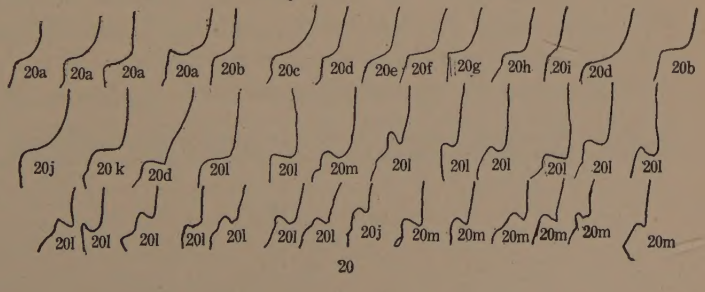
12
A
B
13
14


15
16
17
Tip of Right Clasper
Keel-Hood
Keel-Hook
Secondary Pan
Keel
Pan
Distal Angle
Bulb
Right Clasper Hook
Right Clasper
18


A
B
C
D
E
F
19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